Welcome to Unit 4!!!!:

Linear Functions

and

Arithmetic Sequences

Mindfulness:

Choose Your Breath:

- Initial (monitor/keep rhythm)
- Heart/Belly
- Calming (2 in, 4 out)
- Energizing (4 in, 2 out)

Bell Ringer:

The antifreeze added to your car's cooling system claims that it will protect your car to -35° C and 120° C. The coolant will remain in a liquid state as long as the temperature in Celsius satisfies the inequality

$-35° < C < 120°$. Write this inequality in DEGREES FAHRENHEIT

Remember:

$$C = \frac{5}{9}(F - 32)$$

$$-35° < \frac{5}{9}(F-32) < 120°$$

$$\frac{-35}{\frac{5}{9}} < \frac{\frac{5}{9}(F-32)}{\frac{5}{9}} \qquad \frac{\frac{5}{9}(F-32)}{\frac{5}{9}} < \frac{120}{\frac{5}{9}}$$

$$-35 \cdot \frac{9}{5} < F-32 \qquad F-32 < 120 \cdot \frac{9}{5}$$

$$-7 \cdot 9 \qquad F-32 < 24 \cdot 9$$

$$-63 < F-32 \qquad F < 216+32$$

$$+32 \quad +32$$

$$F < 248°$$

$$-31° < F$$

$$-31° < F < 248°$$

Proportional Relationships
Common Core Algebra I

You've studied proportional relationships in previous courses, but they are the basis of all **linear functions**, so we will take a lesson to recall their particulars.

Proportional Relationships

Two variables have a **proportional relationship** if their respective values are always in the same ratio (they have the same relative size to one another). In equation form, if the two variables are x and y then:

6, $4 $\qquad \frac{y}{x} = \text{constant}$

***Exercise* #1:** At a local farm stand, six apples can be bought for four dollars. Determine how much it would cost to buy the following amounts of apples. Round to the nearest cent, when necessary.

(a) a dozen apples

$8

$\frac{y}{x} = \frac{4\$}{6} = 0.6666$

0.67

(b) 20 apples

$13.40

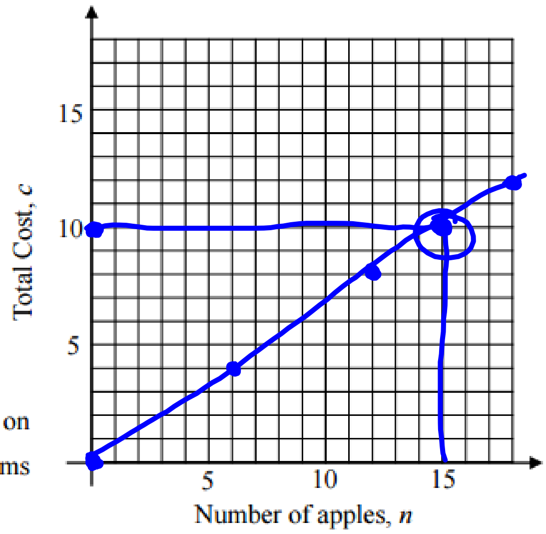
(c) If c is the total cost of apples and n is the number of apples bought, write a proportional relationship between c and n. Solve this equation for the variable c.

$\frac{y}{x}$ = constant -> $\frac{4}{6} = 0.67$

$\frac{c}{n} = 0.67$

$c = 0.67n$

(d) Graph the relationship below.



(e) According to the graph, $c(15)=10$. Illustrate this on your graph. How do you interpret $c(15)=10$ in terms of apples and money spent?

(15,10) => 15 a for $10

***Exercise* #2:** If Jenny can run 5 meters in 2 seconds, then which of the following gives the distance, *d*, she can run over a span of *t*-seconds going at the same constant rate? Show the work that leads to your answer.

(1) $d = \frac{2}{5}t$ (3) $d = 2t + 5$

(2) $d = 5t + 2$ (4) $d = \frac{5}{2}t$

$d = rt$

$d = \frac{5}{2}t$

Exercise #2 illustrates one of the most important proportional relationships, that of distance traveled compared to time traveled at a constant rate. Let's work some more with this.

D	
R ×	T

$D = R \cdot T$

$R = \frac{D}{T} = \frac{5m}{2s}$

$T = \frac{D}{R}$

$\frac{D}{R \mid T}$

***Exercise* #3:** Erika is driving at a constant rate. She travels 120 miles in the span of 2 hours.

(a) If Erika travels at the same **rate**, how far will she travel in 3 hours?

180m

(b) Write a proportional relationship between the distance D that Erika will drive over the time t that she travels, assuming she continues at this same rate. Solve the proportion for D as a function of t.

$R = \frac{D}{T} = \frac{120m}{2hrs} = 60\,mph$

$D = rt$

$D = 60t$

(c) What is the value of the proportionality constant? What are its units?

$\frac{y}{x} = c$ 60 → mph

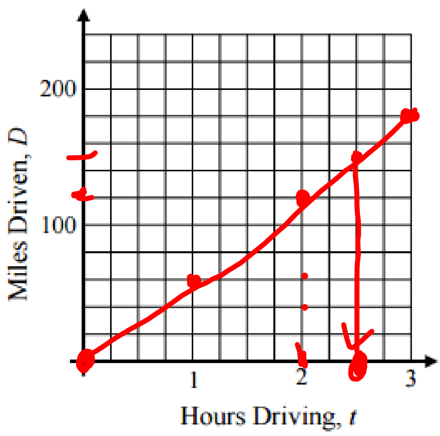
(d) How much time will it take for Erika to travel 150 miles?

2.5

$150 = 60t$

$t = 150/60 = 2.5$

(e) Graph D as a function of t on the axes at the right.



(f) What does the constant of proportionality, from (c) represent about this graph? Explain your thinking.

m = slope

APPLICATIONS

1. A nutrition company is marketing a low-calorie snack brownie. A serving size of the snack is 3 brownies and has a total of 50 calories.

(a) Determine how many calories 6 brownies would have.

100

(b) Determine how many calories 21 brownies would have.

350

(c) Determine how many calories 14 brownies would have. Round to the nearest calorie.

$\frac{y}{x} = c$ $\frac{3}{50}$ $\frac{50}{3}$

0.06 16.67

$\boxed{233}$ 38

(d) If c represents the number of calories and b represents the number of brownies, write a proportional relationship involving c and b and solve it for c.